4. (Amended) A process for etching away a fixed thickness of silicon oxide in an integrated circuit structure on a semiconductor substrate in an etching apparatus which comprises:

a) exposing an oxide surface of an integrated circuit structure on a semiconductor substrate to a nitrogen plasma; and

b) maintaining an rf bias on said semiconductor substrate during said exposure of said oxide surface to said nitrogen plasma;

whereby a fixed thickness of silicon oxide will be removed from said oxide surface, with the oxide thickness removed dependent upon the power level of said rf bias on said semiconductor substrate.

REMARKS

Claims 1-23 remain in the application. Claims 1 and 4 have been amended in response to the 35 U.S.C. 112 rejection.

I. SUMMARY OF THE JUNE 5TH, 2001 OFFICE ACTION

A. Section 112 Rejections

Claims 1 and 4 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. In particular, the term "predetermined" was objected to as being vague and indefinite. The term has been removed from claims 1 and 4 in response to the objection.

B. **Section 103 Rejection**

Claims 1-23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Puchner et al. U.S. Patent 6,156,620 in view of Puntambekar et al. U.S. Patent 5,714,037.

II. THE REFERENCES

A. The Puchner et al. Reference

Puchner et al. U.S. Patent 6,156,620 describes an isolation trench in a silicon semiconductor is provided with a barrier region containing nitrogen atoms formed in the trench, contiguous with the silicon semiconductor substrate surfaces of the trench. The isolation trench structure is formed by forming an isolation trench in a silicon semiconductor substrate; forming in the isolation trench a barrier region by treating the trench structure with nitrogen atoms from a nitrogen plasma; and then forming a silicon oxide layer over the barrier region in the trench to confine the nitrogen atoms in the barrier region. In a preferred embodiment, a silicon oxide liner is first formed over the silicon semiconductor substrate surfaces of the trench, and then the trench structure is treated with nitrogen atoms from a nitrogen plasma to form, on the silicon semiconductor substrate surfaces of the trench, a barrier layer which contains silicon atoms, oxygen atoms, and nitrogen atoms.

B. The Puntambekar et al. Reference

Puntambekar et al. U.S. Patent 5,714,037 teaches the roughening of a silicon oxide surface of a silicon oxide film in a nitrogen plasma in an RIE plasma etcher operating at a high DC bias of 600 volts or greater.

III. THE INVENTION

The invention comprises a process for etching oxide wherein a reproducibly accurate and uniform amount of silicon oxide can be removed from a surface of an oxide previously formed over a semiconductor substrate by exposing the oxide to a nitrogen plasma in an etch chamber while applying an rf bias to a substrate support on which the substrate is supported in the etch chamber. The thickness of the oxide removed in a given period of time may be changed by changing the amount of rf bias applied to the substrate through the substrate support.

IV. DISCUSSION

Claims 1-23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Puchner et al. U.S. Patent 6,156,620 in view of Puntambekar et al. U.S. Patent 5,714,037. Puchner et al. U.S. Patent 6,156,620 is assigned to LSI Logic Corporation, the assignee of this application. Therefore, in view of the changes to 35 U.S.C. 103(c) effective November 29, 1999 (which is prior to the filing date of this application), submitted herewidth is an Affidavit of Common Ownership, which recites the reel, frame, and date of recordal of assignments in the USPTO by the respective inventors named in Puchner et al. U.S. Patent 6,156,620 and the present application, Aronowitz et al. Serial No. 09/464,297, to LSI Logic Corporation, their common assignee. With the submittal of this Affidavit, the Puchner et al. patent should no longer be a citable reference against Applicants' claims. Since the Puntambekar et al. patent is only relied upon for its alleged teaching of the placement of a semiconductor substrate on an elecrode as a substraate support, and this reference teaches the roughening of the surface of a silicon oxide film by maintaining a high DC bias in an RIE plasma etch reactor, Applicants' claims should

be allowable over the cited references.

If the Examiner in charge of this case feels that there are any remaining unresolved issues in this case, the Examiner is urged to call the undersigned attorney at the below listed telephone number which is in the Pacific Coast Time Zone.

Respectfully Submitted,

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DOCKET NO. 99-039

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Claims 1 and 4 have been amended as follows:

1. (Amended) A process for etching away a fixed thickness of silicon oxide in an integrated circuit structure on a semiconductor substrate in an etching chamber which comprises:

a) exposing an oxide surface of said integrated circuit structure on said semiconductor substrate in said etching chamber to a nitrogen plasma; and

b) maintaining a bias~~,~~ on an electrode in said etching chamber~~, a bias at a predetermined power level~~ during said exposure of said oxide surface to said nitrogen plasma to control the flow of components of said nitrogen plasma toward said substrate;

whereby a fixed thickness of silicon oxide will be removed from said oxide surface, with the oxide thickness removed dependent upon the ~~said~~ power level of said bias on said electrode in said etching chamber.

4. (Amended) A process for etching away a fixed thickness of silicon oxide in an integrated circuit structure on a semiconductor substrate in an etching apparatus which comprises:

a) exposing an oxide surface of an integrated circuit structure on a semiconductor substrate to a nitrogen plasma; and

b) maintaining an rf bias ~~at a predetermined power level~~ on said semiconductor substrate during said exposure of said oxide surface to said nitrogen plasma;

whereby a fixed thickness of silicon oxide will be removed from said oxide surface, with the oxide thickness removed dependent upon the ~~said~~ power level of said rf bias on said semiconductor substrate.